US Army Corps of Engineers®
Engineer Research and Development Center

Process and Energy Optimization Assessment (PEOA)

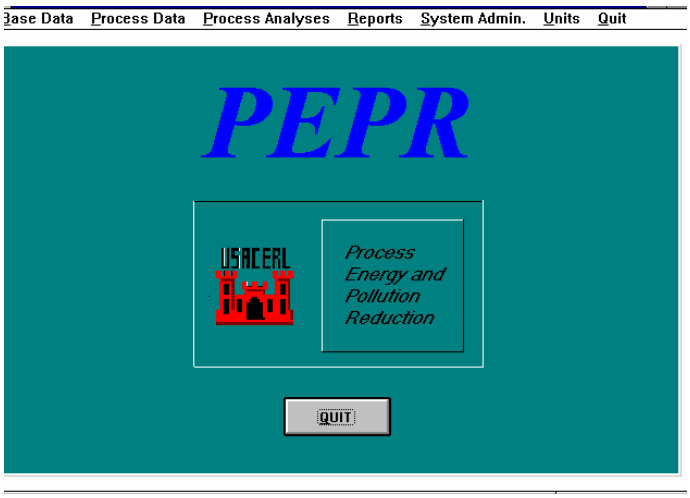
Description

For the past several years, researchers from the Construction Engineering Research Laboratory (CERL) have helped Department of Defense (DOD) industrial facility managers meet energy efficiency and environmental compliance requirements by conducting Process and Energy Optimization Assessments (PEOAs). CERL has also developed data collection and analysis tools and assessment protocols to facilitate the energy assessment. A team of experts begins the PEOA by gathering data from operating personnel, energy generators and suppliers, and waste disposal operations. Advanced instrumentation monitors actual energy consumption and pollutant generation and to verify data. Experts analyze the resulting data, then recommend measures to optimize production processes, reduce energy consumption, and reduce or treat emissions, all of which can result in great cost savings.

The PEOA incorporates a holistic view of the industrial production process from "material and energy in" to "product and waste out"; the process can accompany pollution prevention efforts to estimate energy consumption changes and new pollutant generation. A PEOA goes beyond the traditional "equipment review," which merely seeks to change technology to avoid generating specific regulated contaminants. Instead, it considers new known and/or potential byproducts, along with imposed energy demands.

Capabilities

CERL begins the process by assembling a team of Army researchers and expert consultants to perform the Level I PEOA (a "walk-through review"), which identifies process, energy, and environmental opportunities that can significantly improve the installation's mission readiness and competitive position. The team quantifies these measures with preliminary capital investment requirements, estimated savings, and payback periods. Installation personnel review the Phase I report and select a list of desired projects for a follow-on Level II analysis, which includes an energy and process optimization analysis geared toward funds appropriation. The final Level II effort includes an in-depth analysis that verifies all assumptions and produces a group of "appropriation grade" process improvement projects for funding and implementation.



Supporting Technology

CERL developed the Process Energy and Pollution Reduction (PEPR) software tool to support the PEOA process. (PEPR was developed primarily for use by the expert team, but is made available to participating installations.) The custom application was developed using the Microsoft FoxPro® a relational database management system. CERL also developed an "Energy Assessment Protocol for DoD Industrial Facilities" and an "Industrial Energy Technology Survey" with the support of the Department of Energy (DOE) Industrial Technologies program. The assessment protocol originated from the DOE Industrial Assessment Center located at the University

of Illinois at Chicago, Georgia Institute of Technology, and Rutgers University. The Technology Survey reviewed and documented over 90 recently developed industrial technologies.

Benefits

Reduction in energy use translates directly into cost savings. Preliminary estimates based on process reviews done at representative Army, Navy, and Air Force industrial sites showed that a *one-time* $48 million investment for all DOD process-oriented bases could yield $50 million in savings *annually*. Note that the review examined only seven processes. Many more potential process changes to effect energy savings have not yet been quantified or included in the savings estimate. Experience from private industrial process energy auditing suggests that aggressive pursuit of the PEOA technique could net as much as a 70 percent process energy reduction. Collateral economic benefits, including reduced pollution and waste, and improved product quality often surpass the energy savings.

PEOA tools help DOD industrial facility managers make informed decisions about whether (and how) to modify processes or adopt new technologies. Resulting guidance on renovation and replacement technologies help installations prepare a prioritized implementation plan to meet required energy and environmental goals.

Success Stories

CERL researchers visited large energy-consuming Army industrial facilities, such as Aberdeen Proving Ground, MD; Rock Island Arsenal, IL; Watervliet Arsenal, NY; and Holston Army Ammunition Plant, TN to obtain information on industrial operations. The Army Environmental Center also provided air emission data for many active Army production facilities. A PEOA workshop and Level I and II energy/emission reviews were performed at Pine Bluff, Rock Island, and Watervliet Arsenals. A Level I PEOA was done at Corpus Christi, Tobyhanna, and Sierra Army Depots. The energy and pollution reduction opportunities at Army, Navy, and Air Force sites, which when combined are conservatively estimated to yield 5,660,000 MBtu in potential annual energy savings (12 percent of DOD industrial energy use), have been presented at the annual Industrial Energy Technology Conference, Houston, TX, on five occasions from 1996-2004.

The PEOA methodology has been tailored to complement the Army Materiel Command's "Six Sigma and Lean" program and the Navy's "Best Manufacturing Practices" program, as exemplified by the holistic approach described in ERDC/CERL TR-06-25, *Energy and Process Optimization and Benchmarking of Army Industrial Processes*, which is available through\ URL:

http://www.cecer.army.mil/techreports/ERDC-CERL_TR-06-25/ERDC-CERL_TR-06-25.pdf

A process optimization guide for DOD manufacturing and maintenance facilities has been developed and is being used for process audits at the Army Arsenals and Depots. CERL TR 99/35, *Process Optimization Guide for Military Manufacturing and Maintenance Facilities*, is available for through URL:

http://www.cecer.army.mil/TechReports/lin_prog/lin_prog.uli.post.pdf

CERL TR 96/84, the *Development of the Process Energy and Pollution Reduction (PEPR) Analysis Tool*, is available for through URL:

http://www.cecer.army.mil/TechReports/Lin_DEEP/Lin_DEEP.pdf

ERDC POCs

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